

## **Remarks**

Claims 1 through 23, 46, 47, and 66 through 108 are pending in this application. In the Office Action mailed on September 24, the Examiner objected to the drawings, objected to the Specification, rejected claim 10 under Section 112, and rejected original claims 1 through 65 under Section 103.

Applicant by this paper submits better drawings, amends the Specification, amends claims 20 and 23, cancels claims 24 through 45 and 48 through 65, and adds new claims 66 through 108. Applicant reserves the right to file divisional or continuation applications on the canceled claims.

## **Drawings**

Applicant submits new drawings. The new drawings have the following changes from the original, informal drawings:

1. Figures 1 and 2 are labeled as "Prior Art";
2. Reference characters 2, 12, 13, 14, 16, and 18 were removed from Figure 1 and reference character 2 was removed from Figure 8, as requested in Paragraph 3 of the Office Action.
3. Reference character 112 is added to Figure 8. This reference character is described at page 18, second-to-last line, so no new matter is added.

Please note that certain changes to the Specification, as described below, address other objections to the drawings.

The above-described amendments to the drawings and the below-described amendments to the Specification satisfy the objections in Paragraphs 1 through 5 of the Office Action. Accordingly, Applicant requests that the amended drawings be entered and that the objections be

withdrawn.

### **Specification**

The Examiner objected to a typographical error at page 17, paragraph 2 of the Specification. Applicant amends the Specification as follows:

1. The paragraph beginning on page 10, line 3, is amended to clarify that the collection arm 10 in Figure 1 is a fiber bundle.
2. The paragraph beginning on page 17, line 11 is amended to correct a typographical error. This paragraph is also amended to state that the filter coatings 190 are applied to the distal end of fibers 180. This arrangement is shown in the original drawings and is also referred to at page 18, lines 19-20 (second full paragraph), so no new matter is introduced by this amendment.
3. The paragraph beginning on page 20, line 19 is amended to correct two typographical errors.

No new matter is added by these amendments. Most of these amendments address the Examiner's objection to the disclosure in Paragraph 7 of the Office Action and the Examiner's objections to the drawings in Paragraphs 2, 4, and 5 of the Office Action.

### **Claims—Section 112**

The Examiner objected to claim 10 as being indefinite. Claim 10 recites in pertinent part "wherein said notch filter has an OD greater than 6.0 at 785 nm." Applicant amends claim 10 to recite "The system of claim 1, wherein said notch filter has an optical density ~~OD~~ greater than 6.0 at 785 nm." Accordingly, Applicant respectfully requests withdrawal of this objection.

Applicant notes that the abbreviation "OD" is commonly understood by a person of skill in the art, in the context of a filter, as meaning "optical density". Applicant further notes that the

term “OD > 6.0 at 785 nm, Kaiser” is commonly understood by a person of skill in the art, in the context of a filter, to mean the filter has an optical density greater than 6.0 at 785 nm. Consider, for example, the article *Time-Resolved Microspectroscopy on a Single Crystal of Bacteriorhodopsin Reveals Lattice-Induced Differences in the Photocycle Kinetics*, 91 Biophys. J. 1441 (August 15, 2006) (copy attached as Exhibit A), which was easily located by a simple search on Google. This article states on page 1442:

A notch filter (OD 6 at 532 nm, Kaiser Optical Systems, Ann Arbor, MI) was placed in front of the photomultiplier . . . .

Accordingly, as can be seen from this unbiased evidence, the shorthand “OD”, which used in the context of an optical filter, means optical density.

### **Claims—Section 103**

The Examiner rejected all claims under Section 103. The two main references used are United States Patent No. 6,486,948 to Zeng and United States Patent No. 6,069,689 to Zeng.

Applicant by this paper amends claims 10, 20, 23, and 47, cancels claims 24 through 45 and 48 through 65, and submits new claims 66 through 108:

- Claim 10 is amended as stated above with respect to the Section 112 objection.
- Claim 20 is amended to conform to claim 1.
- Claim 23 is amended to be dependent on claim 1.
- Claim 47 is amended to correct a typographical error in its dependency.

Accordingly, there are three remaining independent claims, 1, 66, and 92. Applicant, for clarity and brevity, will restrict its arguments, with one exception, to the three independent claims.

### Claim 1

The Examiner asserted, in paragraph 12 of the Office Action, that Zeng '948 discloses an illumination fiber, a plurality of collection fibers, a band-pass filter, a notch filter, and a round-to-parabolic linear array filter bundle. Please note, however, that claim 1 did not merely recite these components as a loose conglomeration, without a structural cooperative relationship. Rather, claim 1 recites "a filter adapter *on the proximal end* of said fiber bundle, comprising a band-pass filter . . . ."

The present invention addresses problems that arise in *in vivo* endoscopic Raman spectral measurements. One key specification for an apparatus is a proper filtering mechanism to minimize or eliminate the background Raman and fluorescence signals generated from the fiber-optic material. *See* Specification at page 16, inset paragraph 2. To achieve this specification, the present invention teaches a novel two-step filtering strategy: (1) first-order filtering at the tip of the fiber bundle and (2) high-performance filtering at the entrance point of the instrument channel of the endoscope. *See* Specification at page 16, last paragraph.

Accordingly, the apparatus claimed in claim 1 has a short-pass filter on the distal end of the illumination fiber, and a filter adapter on the proximal end of the fiber bundle, the fiber adapter comprising a band-pass filter for the illumination fiber. This arrangement as claimed in claim 1 confers distinct advantages over the structure disclosed in the prior art. For example, the band-pass filter in the filter adapter isolates the illumination light coming from the light source. (In the preferred embodiment, band-pass filter 122 isolates the illumination light from laser 150 at 785 nm. *See* specification at page 19, second full paragraph). The first-order filter further filters the illumination light. (In the preferred embodiment, short-pass filter 160, with a cut-off of 825 nm, passes light shorter than this wavelength and attenuates longer wavelengths, to

further ensure that no illumination light exists in the signal range above 825 nm. *See* specification at page 19, second full paragraph.

There is a benefit to placement of the filter adapter on the proximal end of the fiber bundle, as claimed in claim 1. Doing so shortens the length of the illumination fiber between the band-pass filter and the tissue. Accordingly, the amount of background Raman signal and fluorescence generated within the illumination fiber, after filtering of the illumination light by the band-pass filter, is decreased, improving the signal-to-noise ratio of the Raman signal induced from the tissue. *See* Specification at page 17, second paragraph.

Additionally, whatever background Raman signal and fluorescence generated within this short length of illumination fiber is attenuated by the short-pass filter on the distal tip of the illumination fiber.

The cited prior art does not disclose these limitations. Zeng '948 discloses a single band-pass filter 34, but does not teach placing that filter at the distal end of the illumination fiber. The present application is a clear improvement over Zeng '948. Zeng '689 does not disclose these limitations either, nor does the combination of Zeng '948 and Zeng '689. Accordingly, Applicant respectfully requests reconsideration of the Section 103 rejection of claim 1.

### **Claim 66**

New claim 66 recites in pertinent part:

a filter adapter receiving said illumination light from said light source and said Raman signal from a fiber bundle assembly, said fiber bundle assembly having a distal end and a proximal end, said fiber bundle assembly configured to pass through an instrument channel of an endoscope, said instrument channel having an entrance at a proximal end of said endoscope, said filter adapter being connected to said fiber bundle

assembly close to said entrance of said instrument channel, said fiber bundle assembly comprising an illumination fiber and a plurality of collection fibers, said illumination fiber receiving said illumination light from said filter adapter, said plurality of collection fibers receiving said Raman signal from the tissue, said filter adapter comprising a band-pass filter for said illumination light and a notch filter for said Raman signal; . . . .

This limitation is supported by the specification at, for example, page 17, first paragraph. Accordingly, it is not new matter. As the cited prior art does not disclose these limitations, as discussed above in connection with claim 1, new independent claim 66 is patentable.

#### **Claim 92**

New claim 92 recites in pertinent part:

a fiber bundle assembly configured to pass through an instrument channel of an endoscope, said instrument channel having an entrance at a proximal end of said endoscope, said fiber bundle assembly comprising an illumination fiber and a plurality of collection fibers, said filter adapter comprising a band-pass filter for said illumination fiber and a notch filter for said plurality of collection fibers, said fiber bundle assembly having a distal end and a proximal end, said filter adapter being connected to said proximal end of said fiber bundle assembly at said entrance of said instrument channel; . . . .

This limitation is supported by the specification at, for example, page 17, first paragraph. Accordingly, it is not new matter. As the cited prior art does not disclose these limitations, as discussed above in connection with claim 1, new independent claim 92 is patentable.

#### **Dependent Claims**

Please note that claims 2 through 23, 46, 47, and 108 depend on claim 1. Since claim 1

is novel and not obvious over the prior art, as explained above, those dependent claims are patentable as well. Similarly, claims 67 through 91 depend on claim 66. Since claim 66 is novel and not obvious over the prior art, as explained above, those dependent claims are patentable as well. Finally, claims 93 through 107 depend on claim 92. Since claim 92 is novel and not obvious over the prior art, as explained above, those dependent claims are patentable as well.

Please note in particular new claims 91, 107, and 108, which recite a limitation of the illumination fiber being metal coated. The metal coating provides optical isolation to prevent cross-talk between the illumination fiber and the collection fibers. This limitation is disclosed in the specification at, for example, page 19, first two lines (continued paragraph from preceding page). Accordingly, these claims do not recite new matter.

Accordingly, Applicant requests that the Section 103 rejections be withdrawn and that claims 1 through 23, 46, 47, and 66 through 108 be allowed.

## **Summary**

Applicant amended the claims and the drawings to correct typographical errors and to meet informality rejections. Applicant submits new claims defining the invention. The prior art of record does not teach the limitations of the claims. The claims are therefore allowable over the prior art. Applicant accordingly respectfully requests allowance of the pending claims.

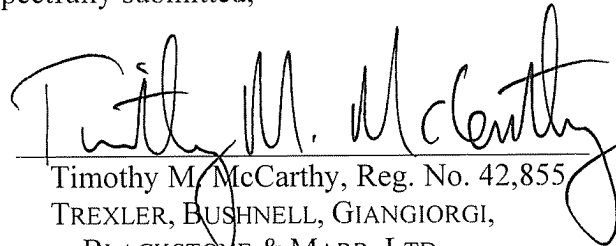
Applicant believes that no fee is required for this submission. If the Examiner disagrees, the United States Patent and Trademark Office is hereby authorized and requested to charge the fee associated with this Response to the deposit account of the undersigned firm, Account No. 20-1495.

Should the Examiner have any questions regarding this Amendment, the Examiner is invited to contact the undersigned attorney at (312) 704-1890.

Respectfully submitted,

Dated: December 14, 2007

By:

A handwritten signature in black ink, appearing to read "Timothy M. McCarthy". The signature is written over a horizontal line that serves as a separator between the signature and the printed name.

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